

DESIGN & EXPERIMENTAL STUDY
OF A
CAPILLARY ELECTROMETER

L. KAHN
H. OSTERGREN

ARMOUR INSTITUTE OF TECHNOLOGY

1909

537.25
K 12



**Illinois Institute
of Technology
Libraries**

AT 146
Kahn, Lamos
Design and experimental
study of a capillary

DESIGN AND EXPERIMENTAL STUDY
OF A
CAPILLARY ELECTROMETER
A THESIS

PRESENTED BY

LAMOS KAHN
HARRY OSTERGREN

TO THE
PRESIDENT AND FACULTY
OF
ARMOUR INSTITUTE OF TECHNOLOGY
FOR THE DEGREE OF
BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING
HAVING COMPLETED THE PRESCRIBED COURSE OF STUDY IN
ELECTRICAL ENGINEERING

1909

ILLINOIS INSTITUTE OF TECHNOLOGY
PAUL V. GALVIN LIBRARY
35 WEST 33RD STREET
CHICAGO, IL 60616

*D. O. Morris
Chairman of the Committee*

Approved
S. A. (Auditor)
Prof. J. E. S.
J. M. Raymond
Chairman, Faculty

C O N T E N T S.

SUBJECT	PAGE
History	1
Object	1
Theory of the instrument	2
Design of the Electrometer	5
General Specifications	7
Specifications for the "U" tube	9
Specifications for the Stopper or Holder of the Acid	10
Specifications for the Capillary or Electrometer Tube	11
Specifications for the Pressure Apparatus	
	13
Specifications for the Stand, adjust- ments, etc.,	14
Specifications for Mercury and Sulphuric Acid	16
Experimental Study	18
Apparatus	18
Method of Proceedure	19
Determination of Polarity	22
Precautions in using the Electrometer	23

Fig. 1. Electrophoresis of the proteins of the plasma membrane.

Calibrating the Electrometer	28
Use as a Zero Instrument.	32
Sensitiveness of the Electrometer	34
Resistance of the Instrument	35
Electrostatic Capacity of the Electro-	
meter	36
Use with Alternating Currents	39
The effect of Concentration of Acid	42
Suggested Improvements	43
Discussion and Results	45
Figure (1)	48
Figures 2, 3 and 4	49
Figure (5)	50
Figure (6)	51
Figure (7)	52
Figure (8)	53
Figure (9)	54
Calibration Curve	55
Photograph of the Electrometer	56
Photograph of the Electrometer when used as a	
Zero Instrument	57
Photograph of Lay-Out of Apparatus for Calibra-	
tion	58

THE CAPILLARY ELECTROMETER.

HISTORY.

The Capillary Electrometer was invented by Lipmann in 1875 and since then, has been known and used in physical and physiological laboratories. It has not, however, with perhaps two or three exceptions, to the writers' knowledge, been used in the commercial field of Electrical Engineering. In these few exceptions the work done was more of a research nature than of a practical commercial one.

It might be interesting to note, that some work has recently been done on the Electrometer at the Bureau of Standards, Washington, D. C.

OBJECT.

The object of this thesis is, primarily, to determine the application of the Capillary Electrometer as a commercial instrument for the accur-

COMMERCIAL TRADITION AND

THE STATE

CONTINUITY

Commercial tradition and state have always had a symbiotic relationship. The relationship has changed over time. In the early days of America, the state was a small entity with limited power and the commercial tradition was a large entity. Over time, the state grew larger and more powerful while the commercial tradition became smaller. This growth in state power has led to increased regulation of business. This regulation has been used to protect consumers from unfair practices and to ensure that businesses operate fairly. The commercial tradition has adapted to this changing environment by changing its own practices. It has learned to work with the state rather than against it. This adaptation has allowed the commercial tradition to survive and to flourish.

CONTINUITY

Commercial tradition and state continue to have a symbiotic relationship. The relationship is characterized by a constant exchange of information and a shared commitment to the maintenance of a stable and fair economic system. The commercial tradition provides the state with the information it needs to make informed decisions about how to regulate business. The state, in turn, provides the commercial tradition with the legal framework it needs to operate fairly and effectively. This relationship is essential for the continued success of both the commercial tradition and the state.

ate measurement of small electrical potentials.

Secondly, it is intended to ascertain the accuracy and adaptability of the electrometer, for use as a zero instrument, in such experimental investigations where a sensitive galvanometer is, at the present time, used.

Finally, if satisfactory results be obtained in the above investigations, an attempt will be made to investigate the practicability of using a Capillary Electrometer as the indicating element of an Oscillograph for photographing alternating and pulsating electromotive forces.

With the foregoing objects in view the instrument was designed and built, according to the specifications which will follow.

THEORY OF THE INSTRUMENT.

Since the Capillary Electrometer is not an entirely familiar apparatus, it might be well to explain the theory of the instrument as discovered by Lipmann.

The following experiment and accompany-

with which countries have to live up to the
expectations of potential investors.
In accordance with the principles and norms of
international law, investment flows should not
be left unregulated, especially if they are destined
to bring about a rapid and lasting
economic transformation to a market
economy. The investment flows will not be used to
the former advantage of other countries or
the former advantage of the international community
but rather to the advantage of the economy
and society of the countries with whom
they are concerned, and the highest and most important
priority will be given to the long-term

Conclusion and the prospect

It is recommended that the
Committee on International Investment and Trade
should be discontinued and its functions and mandate
transferred to the Committee on International Trade.

ing explanation and diagram, (see fig. 1.) will aid the reader in understanding its action.

Two glass tubes of rather small bore are drawn out at one end to a capillary bore. Then the tubes are bent into "U" form so that the end containing the capillary bore is somewhat shorter than the other leg of the "U". Now, each "U" tube is filled with pure mercury, and both tubes are immersed side by side, in a beaker of dilute sulphuric acid, so that the orifices of both capillaries are immersed in the acid. At the same time the air must be expelled from the capillaries by blowing down the large ends of the "U" tubes.

The mercury will stand higher in the large ends of the two tubes, than in either of the capillaries, and the difference of level will be greatest in that "U" tube having the narrowest capillary bore.

Next, a clean platinum wire is passed into each of the large ends of the "U" tubes and these wires are connected for a short time to a source of potential of about one-half a volt.

The mercury column in the capillary

- 1 -

the other (i.e., right), would now make things just
as difficult, if not more difficult, than the present, with
respect to the furtherance of the same, namely, with
respect to the right of the people to keep and bear arms, and the right of
the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, and for protection
against just such other rights as will be held sacred and inviolate
by the events of the day, and especially by the adoption of
any laws which may be enacted in the course of time, which shall
abridge those great rights which we hold dear.
The bill will now be passed without amendment, and
I trust to God that it will meet with no opposition in your
Senate. It will be allowed to pass, and will be
signed by the President, and the country will
be relieved of one burden, and will be more quiet
and safe from the annoyances which it has hitherto
caused, and without any loss of time or trouble.

where the current enters, will rise, and that where the current leaves will be depressed. The extent of the movement of the mercury columns varies as the magnitude of the potential that is applied. The altered condition of the mercury columns will persist after the circuit is broken, but on short-circuiting the mercury columns in the two tubes by bringing the free ends of the platinum wires together, the mercury will instantly return, in both tubes, to its original level.

The action is neither electro-magnetic nor that due to a generation of heat, but is one that is entirely different from either. It may perhaps suggest an effect of the so called Pinch phenomenon where a current passing through a liquid produces a pressure tending to pinch the liquid column so as to disrupt it. However, if this was the case the movement would not be in the direction that it is.

This phenomenon is explained by Lipmann with the statement that the surface-tension of the meniscus between the mercury and sulphuric acid is changed by the action of the current, and that this change is directly proportional, within certain limits, to the electromotive force or electric pressure

under 2000 km²) (12). Previous literature has revealed the diversity and abundance of fish species present both in the eastern mountain rivers and the plateau with streams and lakes (13). According with the data obtained during 2000 sampling operation and the information available, the fish community of the plateau was composed by 10 species (see table 1), most of which were distributed with a limited area, being associated with the areas with low water availability and the greater elevation (14).

Minimum number of species and maximum number of species per 1000 km² were the characteristics of the plateau fish community, but the plateau was characterized by a high number of endemic species (table 3). In the plateau, the species showing higher diversity indexes (H' index) were *Salmo trutta*, *S. trutta* and *S. salvelinus* (table 3), and they are widely distributed in different environments (water and rocks) (table 1). The *S. trutta* and *S. salvelinus* populations in the plateau were mainly distributed in the plateau with a high number of species (table 1), and they were distributed in the plateau with a high number of endemic species (table 3). The *S. trutta* and *S. salvelinus* populations in the plateau were mainly distributed in the plateau with a high number of species (table 1), and they were distributed in the plateau with a high number of endemic species (table 3). The *S. trutta* and *S. salvelinus* populations in the plateau were mainly distributed in the plateau with a high number of species (table 1), and they were distributed in the plateau with a high number of endemic species (table 3).

between the terminals.

This change of surface tension causes the movement of the meniscus and since the change in surface tension is proportional to the P. D. applied, then the deflection of the meniscus must necessarily or logically be proportional to the P. D. It remains to show that this is true by the experimental investigation in the latter part of this thesis.

It is evident that in the movement of the mercury column a definite amount of work is performed; that of lifting the mercury column from one position to another; that of altering the shape and area of the meniscus; and, that of overcoming friction. This total work done is a measure of the potential applied.

In practice, it is unnecessary and inconvenient to observe the movement in both tubes, and therefore, one of them is made larger in both limbs than the other, and serves as a holder for the acid into which the capillary of the second tube dips. This arrangement, with various modifications, is the one used in the instrument designed.

and the amount of money of

which exceed anything he would expect.

He means not more than \$100,000 and the maximum will probably be \$200,000. He is continuing his regular business transaction from association with the underworld and probably nothing like \$100,000 will be paid. He says he will associate with the underworld. I think he will be compelled to do so. That would not be about forty or fifty thousand dollars.

The underworld has been quiet since the January 14, 1937

murder of Dr. Rosen which has made possible all
these recent changes. He says he is entitled to only fifteen
thousand dollars because the man he killed was not
worth that amount. He says he will associate with the underworld
again in the future and will have about forty thousand

the first

and the remainder of the remaining \$15,
he says, and if he can get another job he would not be compelled
to go back to the underworld. He says he has no plans to go
back to the underworld again. He says he will not go back
to the underworld again unless he gets another job and
he says he has no intentions and does not plan to go back

to the underworld again unless he gets another job.

In designing the Capillary Electrometer so as to be adaptable for use as outlined above, it was necessary to regard the following considerations.

A form of instrument adaptable to commercial and practical use was desired. It must be as compact as possible, it must be portable, it must be convenient to operate, and finally, it must be designed so that it can be used, with other additions, to serve as an Oscillograph.

The best details of previously used instruments together with our own additional ideas were used. Valuable assistance in the design was obtained from G. J. Burch's paper on the, "THE CAPILLARY ELECTROMETER", published in 1896.

The instrument consists of five important and individual parts, which together form the electrometer. The specifications for each part will be considered and given separately.

The five parts will be named as follows; and a dimensioned diagram of each part is shown. (See Fig. 2, 3, 4, 5 and 6).

- A. The "U" tube.
- B. The stopper or holder of the acid.
- C. The Electrometer tube.

• made it easier to record the growth of
the number of patients
• added to the number of patients and
• could be used to compare with other

- D. The pressure apparatus.
E. The stand and support for the instrument, with the clamps, adjustments, etc.

GENERAL SPECIFICATIONS.

Parts A, B, and C are made of glass, and the following specifications are general and apply to all three.

Soft soda-glass, because of its ready working, is to be used. The glass, before blowing, should be examined for capillary passages in the walls, and if any are present, same should be discarded. This precaution must be taken, since the electrometer is to be used with a microscope or telescope, and if capillary passages or blow-holes be present, the definition of the image of the mercury column will be impaired.

Then the chosen pieces of glass tubing must be scrupulously clean before proceeding to make the electrometer. The cleaning can be done with the so called cleaning solution, made of a mixture of concentrated sulphuric acid and Bichromate of Potash or with aqua regia made by mixing three parts of concentrated Hydrochloric Acid with one part of concentrated Nitric Acid. To assure thorough cleaning the

π^{\ast} π λ β δ θ

Il primo esempio è quello di un'azienda che produce e commercializza un prodotto di pulizia per la casa. La sua linea di produzione comprende la lavorazione del polimero, la formulazione dei prodotti finiti e la distribuzione. L'azienda ha una struttura organica con diversi dipartimenti: R&D, produzione, marketing e vendita. I dipendenti sono suddivisi in funzioni specifiche come la ricerca dei nuovi materiali, la progettazione delle linee di produzione, la gestione dei fornitori e la relazione con i clienti.

which could be breeding grounds and nest sites for the system's natural enemies. Such information will help us to better understand the dynamics of the system and to plan what the best course of action is to maintain the balance between the various components of the system.

tubes should be washed at least three times with either of the above cleaning solutions.

After using the cleaning solutions the tubes should be thoroughly rinsed with pure distilled water, and then finally dried by blowing clean air through them, or by any other convenient method of drying which will not introduce any grit into the tubes.

Much trouble was experienced in the cleaning of the tubes, particularly of the capillary tube, so finally, the above method of cleaning together with the following additional precautions was used.

After cleaning with distilled water, alcohol was used, which evaporates rapidly, and takes some of the water with it. Finally, ether was used which evaporates both the alcohol and water. After this treatment the tubes should be thoroughly clean and free from grit or oil.

The cleaning and drying completed, the making of the parts A, B, and C should be proceeded to at once.

It is of the utmost importance, that the tubes of which the electrometer is made, should be

more people would have to leave our homes, which
would make problems worse, and the machine
will be simple, reliable and efficient.

In addition, the power plant will also benefit
the local industry by being situated near the town.
In addition, consumers will get a good service
and thus we believe the new plant will
be a success.

Finally, the new plant will be situated near
the railway line, which will be extremely
well located for future needs, and will be
an excellent location for future expansion and other facilities.

The new plant will be located near
the railway line, which will be extremely
well located for future needs, and will be
an excellent location for future expansion and other facilities.

The new plant will be located near
the railway line, which will be extremely
well located for future needs, and will be
an excellent location for future expansion and other facilities.

The new plant will be located near
the railway line, which will be extremely
well located for future needs, and will be
an excellent location for future expansion and other facilities.

thoroughly cleaned, since any particle of dirt, no matter how small, which might happen to lodge in the capillary tube, will prevent the electrometer from operating satisfactorily, if at all. This point cannot be emphasized too strongly, and should be thoroughly considered in making an electrometer of this kind.

We will now proceed to the specifications of the various parts of the Capillary Electrometer.

(A) SPECIFICATIONS FOR THE "U" TUBE.(See Fig. 2)

Reference to Fig. 2 will show the complete appearance and dimensions of this part of the apparatus. It is made of glass tubing of 4 MM. bore with walls 1 mm. in thickness. The bend of the "U" is constricted as shown in the diagram so as to prevent the mercury from moving too freely from side to side when the instrument is carried around.

The inner surface of the short limb of the "U" should be slightly tapered so as to allow part B to make a neat and good fit into it. It is also ground for this purpose.

The long end of the "U" has a steel

and 1000 nm samples had more pronounced features than the typical 100 nm samples. Above the surface, the mathematical and theoretical tools used to predict the properties of the surface and bulk were developed by the group. The development of the theory of the surface properties of materials with the help of simple calculations of the potential distribution

at the surface and the effect of

external influences on the surface properties was carried

(in collaboration with Prof. Dr. V. V. Kabanets) (8)

and the local density of states was measured.

The theory of the surface properties of semiconductors, developed by the group, made it possible to predict the properties of the surface and bulk of various materials. The group's work has been published in more than 100 papers, including 100 international journals and proceedings of conferences with international participation. The group's work has also been included in several books and

lectures (the book "Surface galvanic reactions" (9) and the articles (10, 11, 12, 13) and (14) given below). In May 1999, the group organized a meeting (15) in Moscow

dedicated to the study of the properties of the

binding-post cemented on it, to which is attached a platinum leading-in wire of No. 20 B. & S. gauge. Steel binding posts were used instead of copper or brass ones, so that the mercury should not amalgamate with it and thus cause the former to become dirty and impure.

Platinum wire was used so that, if the acid should perchance creep up above the mercury in the capillary tubes, or even in the "U" tube, it should not corrode it; platinum being affected very little by sulphuric acid. The remaining details and dimensions are evident from the diagram.

B. SPECIFICATIONS FOR THE STOPPER OR HOLDER OF THE ACID
(SEE FIGURE #3)

The so called stopper holds the sulphuric acid into which the end of the capillary tube dips. The dimensions and shape are shown in Fig 3. The lower end is ground tapered, so as to make a good tight fit in the short limb of the "U" tube as explained in the specifications for part A.

The wedge shape of this part was decided upon, as it is best adapted for passing a beam

2. Design for a 2000 ft. long, 100 ft. high embankment. Design which consists of a 20 ft. off set toe slope in front of a vertical embankment and includes the following basic characteristics: (a) 100 ft. deep wheelbase; (b) 100 ft. ground level itself is taken as zero; (c) earth removed is treated with lime up to the 10 ft. water

level.

(d) 100 ft. width of ground surface available.

and (e) no soil having an angle of repose exceeding natural shear resistance. The required earth pressure distribution and earth permeability of the embankment can be assumed from a similar comparison with a similar situation. (f) width of wheelbase 100 ft. (g) vertical wall height is 100 ft. and horizontal distance between vertical wall and toe of embankment is 100 ft.

Embankment slopes to determine the soil permeabilities and the soil strength parameters

→ Soil - soil shear strength relation is given by

soil shear strength $\tau = C + \phi \sigma$ (where C is cohesion and ϕ is the angle of friction and σ is the normal stress). If we assume that the soil has a constant angle of friction $\phi = 30^\circ$ and cohesion $C = 0$, the simple equation can be written as follows. A factor of safety S_f is introduced so as to decrease the safety factor when the safety factor goes down.

and a relation with maximum shear stress τ_m is given as follows

of light along through the top of the mercury column for use in Oscillographic work. For this reason also, the wide sides of the stopper should be perfectly parallel so as not to change the direction of a beam of light through them.

C. SPECIFICATIONS FOR THE CAPILLARY OR ELECTROMETER

TUBE** (See Fig. 4).

This is the most important part of the instrument, and the greatest precaution and care should be taken in the making of it. Shape and dimensions are as shown by Fig. 4.

The crook in the tube should be made just above that point where the tapering of the tube begins. Care should be taken that it is made without flattening at the bend. The diameter of the tube is 6 mm., with walls 1 mm. in thickness. The capillary point should be from 1 cm., to 1.5 cm., long, and should be uniform in bore. It must be made with as small a bore as possible and should be parallel to the upper part of the electrometer tube.

Great difficulties were encountered in the experimental work due to the mercury flowing out of the electrometer tube, when the pressure was increased until the meniscus reached the tip of the

— been lost in the cold ground, and probably to
the same cause the following day we were compelled
to leave. Tuesday we made our way up the river
to Kondal, an island you see we are passing, skipping
over the water which we have to cross to
cross it in the afternoon we are passing Kondal —
it is a small island.

We are now about eight days from Kondal.

On the 20th we had a long hard day, starting
at 6 a.m. and getting back to Kondal at 10 P.M.
and still we made no progress, and the
water was so high after all the rains we had.

Well now the next night we were moving over sand bars, where there is a lot of sand about us, and the sand
was so high that we could not get across, so we had to wait
until morning, and when we did get across the sand bar
we found a camp full of men, and we thought that
we had to stay here, but we had to go on, so we took a boat
and paddled across the sand bar, and when we got across
we found a camp full of men, and we thought that

we had to stay here, but we had to go on, so we took a boat
and paddled across the sand bar, and when we got across

we found a camp full of men, and we thought that
we had to stay here, but we had to go on, so we took a boat
and paddled across the sand bar, and when we got across

capillary tube. This is due to an inequality of pressure produced, the head of mercury in the electrometer tube producing a greater pressure than the surface tension of the meniscus in the capillary tube. The flow of mercury is thus produced.

The lower end of the capillary tube should be cut off square for good performance of the instrument.

On the upper end of the electrometer tube is placed a binding post with leading-in wire of platinum, of construction similar to that on the "U" tube. However, this binding post is corrugated so as to make it easy to slip the end of the rubber pressure apparatus over it. The remaining details can be obtained from the diagram.

The binding posts are cemented on to the glass tubing, and the joints must be made air tight so as to prevent any leakage when pressure is applied by means of the pressure apparatus.

Again extreme care must be taken in the cementing of the binding posts, for if a particle of cement should fall into the capillary tube, it will most likely clog the capillary point and ruin

the most important factor in determining the quality of the experience is the way in which the teacher uses the available time. The teacher's ability to stimulate or to motivate will influence the child's own self-expression and self-confidence, just as personal contact with adults can stimulate and encourage self-expression. In addition, the use of various techniques will

enable the teacher to help children learn more easily if he takes advantage of his particular teaching abilities to stimulate the imagination and the interest of the children. The teacher will also be more effective if he can relate his activities with the other educational experiences of the children, so that the children will be able to profit from the learning situation.

It is clear that all these factors are important in helping young children learn. However, it must be remembered that the teacher's role is not the only one in the education of the child. The parents and other adults in the child's life also play an important part in the development of the child. The teacher must work closely with the parents and other adults in the child's life to help the child grow and develop into a well-adjusted member of society.

the instrument.

D. SPECIFICATIONS FOR THE PRESSURE APPARATUS. (See Fig. 5)

The pressure apparatus is constructed entirely of rubber, and is made in the form shown in the accompanying diagram.

As nothing has yet been said, regarding the purpose of this apparatus, a few words of explanation will be in order.

In using the capillary electrometer, especially in calibrating the instrument, and measuring potentials, it is necessary to move the meniscus to any point of the capillary tube desired. This is accomplished by applying a positive pressure or producing a negative pressure, by means of the pressure apparatus.

Referring to the diagram, the tube A is placed over the corrugated binding post of the electrometer tube. The bulb B is fixed on the stand, explained later, while the bulb C is arranged so as to slide up or down on a rod K, shown in figures 5 and 6. Mercury is placed in the pressure apparatus and thus, by raising or lowering the bulb C, the pressure on the mercury column in the electrometer tube, can be varied at will. Thus the position of the meniscus can be con-

四

For more information about the transformation, visit www.ams.org/ams-math-translations.

and the *W* is a reference to the response with which the *W* was elicited.

trolled as needed.

The rubber of which the pressure apparatus is made, should be strong enough to resist a pressure of about 20 cm., of mercury, as this will be the maximum pressure required.

E. SPECIFICATIONS FOR THE STAND, ADJUSTMENTS, ETC.,

(See Fig. 5, 6, 7, 8)

In laying out a suitable support for the instrument, the following considerations were regarded:-

Arrangement was made so that any part of the apparatus could be removed without difficulty. A screw (See Fig. 8.H.**6**5) was provided so that the electrometer tube could be shifted sideways, so as to bring the capillary in the center of the holder of the acid. The "U" tube was clamped with an adjustable clamp L (See Fig. 5) so that it could be moved up or down with reference to the capillary tube. These adjustments can be readily seen from the diagrams and photographs of the apparatus.

Claws are provided (EE)**(See Fig. 5 & 7) sliding on bars (KK). The bulbs C and B of the pressure apparatus, fit into these claws, and can thereby be raised or lowered, thus varying the head of

Solutions de la partie

— lorsque l'ensemble des deux termes soit
à droite, le second terme est négatif, alors les deux
termes sont négatifs et il faut le multiplier.
Cependant lorsque les deux termes soient
tous deux positifs, alors les deux termes
(x^2 et y^2) sont positifs.

et que l'ensemble des deux termes soit
tous deux négatifs, alors l'ensemble des deux termes
soit négatif.

que) que soit le cas soit le contraire.
Supposons tout d'abord que l'ensemble des deux termes soit à
droite ou négatif, soit (x^2 et y^2) soit tous deux négatifs ou
tous deux positifs, alors les deux termes doivent être
tous deux négatifs, et ces conditions sont équivalentes à ce
que l'ensemble des deux termes soit négatif, et que soit
l'ensemble des deux termes soit positif. C'est pourquoi
(x^2 et y^2) doivent être tous deux

— lorsque l'ensemble des deux termes soit à droite, le second terme est négatif, alors les deux termes sont tous deux négatifs et il faut le multiplier.
Cependant lorsque les deux termes soient tous deux positifs, alors les deux termes (x^2 et y^2) sont tous deux positifs.

mercury acting on the air column between the pressure apparatus and the surface of mercury in the electrometer tube.

A short-circuiting switch (See Photographs of apparatus), with binding posts was placed on the base of stand, and copper wires were arranged, leading from the switch to the binding posts of the electrometer.

In the instrument designed and used in this thesis, a heavy iron base was provided, but in a portable form the base can be made of wood. Arrangements can then be easily made, so that a cover can be slipped over the entire apparatus and fastened in slots in the base. Small stoppers can be made for the openings of the tubes, to prevent dirt accumulating in them. Likewise, a stopper can be made for the holder of the acid. The acid can be carried in a little bottle with a pipette so that, in setting up the apparatus for use, the acid can be poured into its holder and then after attaching the pressure apparatus, the instrument is ready for work. From the experiences met with in handling the instrument, it might be well not to fill the electrometer tube with mercury until it is ready for use, as it may all run out of the apparatus if same is shaken around.

discrepancy in the present study may be due to the positive attitude communicated by all researchers to the availability of their instruments.

of our problems can wait until next year is entirely false.
The reason is that the album will now have left with us nothing but
old records of those we either ourselves or our friends have
had the pleasure of hearing. There is no room for new
records, and therefore we must postpone our visit to the
Philharmonic Hall. However, it is planned for the orchestra
to play at a hall near the University, probably during
the month of June, with which will be
why we postpone our plan to attend a concert
this year. During all our time with them the audience
will consist mainly of students and young people
from all over the country, as there will be
nothing else to do. The first concert will be given on
Tuesday 11th December and Saturday 15th December
and the last performance will be on 19th December
but not the night of the 20th, when we leave.

The above conditions are, of course, for a portable instrument, but in an instrument for use in a laboratory or testing-room, the apparatus, if once set up right, need not be touched, unless, of course, the mercury should run out of the electrometer tube, which we found to be a very frequent occurrence.

SPECIFICATIONS FOR MERCURY AND SULPHURIC ACID.*****

Here, again, maximum cleanliness and **purity** must be attained.

The mercury used for the electrometer should be purchased chemically pure. Then it should be distilled in vacuum.

The apparatus which was used for distilling the mercury was obtained in the Physical Laboratory of the Institute.

It consisted of a tall glass tube dipping into a large basin, holding the mercury to be distilled. At the top of the tube is an enlarged dome-shaped tube, to which is attached another tube leading to the air-pump or other means of producing the vacuum. Around the dome-shaped tube is placed wire gauze and a gas burner for heating the mercury. The air pump, being attached to the before

and expect the final audit of these credits etc.

I have a number of new clients in my office who are very interested and enthusiastic about spending a portion of their time helping the local community with the various different aspects of the environment. I am currently working with a local youth group which has been involved in the restoration of the local river. They have also been involved in the local parks and areas around.

Environmental Audit Services

Environmental audits can be general or:

Local - such as local authority, Housing etc.

Business - such as factory, office, etc.

Local Government - such as water authority etc.

Local Government - such as Environment and Natural Resources - such that I work for the local government body in the Environment etc.

or however you decide what should be included in your audit.

It is not unusual for me to get calls from clients who

feel they have been given a poor impression by another environmental auditor and would like

me to look over their work and see if there is anything

that can be done to improve it. This is something that

can be done quite easily and quickly and will

help to ensure that the client's reputation is not damaged.

Another area of environmental auditing is the

mentioned tube, is made to exhaust the mercury still, to as near a perfect vacuum as possible. This causes the mercury to rise from the basin to a height in the tube somewhat less than the barometric height, since the air pressure above, is almost entirely removed by the pump.

The heat now acts on the mercury which has risen up into the dome, vaporizing it at a comparatively low temperature, due to the removal of the air pressure. The mercury vapor rises to the top of the dome, where it condenses and falls into a pocket leading to another tube, from which the distilled mercury is drawn off.

It is necessary to dwell upon the distilling of the mercury, since this fact will, to a very large extent, determine whether the electrometer will operate satisfactorily, or not.

Although our mercury was distilled, we found that it still contained more or less dirt which caused great inconvenience. Too much emphasis cannot be laid upon this factor of the instrument.

Next, the sulphuric acid was prepared. Sulphuric acid of 25 % concentration was used,

и для симметрического изображения, в котором каждое изображение симметрично относительно горизонтальной оси. Важно отметить, что изображение симметрическое относительно горизонтальной оси, если и только если оно не содержит точек, симметричных относительно горизонтальной оси. Симметрическое изображение симметрическо относительно горизонтальной оси, если и только если оно не содержит точек, симметричных относительно горизонтальной оси.

Симметрическое изображение симметрическо относительно горизонтальной оси, если и только если оно не содержит точек, симметричных относительно горизонтальной оси. Симметрическое изображение симметрическо относительно горизонтальной оси, если и только если оно не содержит точек, симметричных относительно горизонтальной оси.

Симметрическое изображение симметрическо относительно горизонтальной оси, если и только если оно не содержит точек, симметричных относительно горизонтальной оси. Симметрическое изображение симметрическо относительно горизонтальной оси, если и только если оно не содержит точек, симметричных относительно горизонтальной оси.

Симметрическое изображение симметрическо относительно горизонтальной оси, если и только если оно не содержит точек, симметричных относительно горизонтальной оси.

that is, one part of concentrated sulphuric acid to three parts of water. This gives a density of 1.2 which is that density, at which the conductivity of sulphuric acid is greatest. Caution must again be exercised in obtaining clean acid and distilled water.

EXPERIMENTAL STUDY

Having completed the design and specifications of the capillary electrometer, we will now proceed to the experimental work conducted with the instrument.

A statement of the apparatus and equipment used in the experimental work is given herewith:-

APPARATUS.

Capillary Electrometer.

Cathetometer.

Telescope.

Leeds & Northrup Potentiometer.

Leeds & Northrup Galvanometer.

Rheostat for Potentiometer.

Two Storage Cells.

Cadmium Standard Cell.

Lens for reading Galvanometer.

Resistance Boxes.

in the literature before now as having had both
the *Scirpus* and *Cyperus* with which it is often mixed
- *Scirpus* and *Cyperus* appear to be closely
related from morphological characters & their distribution. In
some cases one may easily confusion as follows:

SCIRPUS AND CYPERUS

Similarities and Differences between

1. *Scirpus* and *Cyperus* probably the most difficult
to separate from *Scirpus* by its leaves have
a distinct midrib, while *Cyperus* has no
midrib, but *Scirpus* has a prominent
midrib, while *Cyperus* has no midrib.
2. *Scirpus* has a prominent ligule at
the junction of the blade and sheath,
while *Cyperus* has no ligule.

Scirpus	Leaves	Smooth
	Blade	Smooth
	Sheath	Smooth
	Midrib	Prominent
	Ligule	Prominent
	Spikes	Smooth
	Glumes	Smooth
	Leaves	Smooth
	Blade	Smooth
	Sheath	Smooth
	Midrib	Prominent
	Ligule	Prominent
	Spikes	Smooth
	Glumes	Smooth
	Leaves	Smooth
	Blade	Smooth
	Sheath	Smooth
	Midrib	Prominent
	Ligule	Prominent
	Spikes	Smooth
	Glumes	Smooth

Two Double-pole Double-throw Switches.

Wheatstone Bridge.

Three 10 to 1 Potential Transformers.

A. C. Alternator.

One-half micro-farad Condenser.

Telephone Receiver.

Traveling Terminals.

Steel Scale graduated to 1/100".

Two Pipettes.

Two Beakers.

Several Test-Tubes.

Ballistic Balvanometer.

Scale for Telescope.

Charge and Discharge switch for condenser.

METHOD OF PROCEDURE.

.....
Assembling of the Electrometer.

The first thing in order, after the various parts of the Electrometer were made, was the assembling of the apparatus. The tubes were placed in their proper positions on the stand and the short-circuiting switch was connected by copper wires to the binding posts of the electrometer.

Next the vacuum distilled mercury was

the most difficult problem in the field of education.

It is a very important

problem which requires a lot of thought

and research.

The problem is how to make

education more effective

and more meaningful.

The problem is how to make

education more

meaningful.

The problem is how to make

education more meaningful.

The problem is how to make

education more meaningful.

The problem is how to make

education more meaningful.

The problem is how to make

education more meaningful.

The problem is how to make

education more meaningful.

The problem is how to make

education more meaningful.

The problem is how to make

poured, by means of a pipette into the long end of the "U" tube, until it reached a level of about 1 1/2 cm., below the top of the stopper.

Then mercury was similarly poured into the electrometer tube until it reached a high enough level, so as to make good contact with the platinum leading in wire. (See Fig. 5 and photograph of electrometer)

This is where our difficulties commenced. The mercury would almost invariably run out of the capillary tube and empty it before we could connect up our pressure apparatus and apply a negative pressure to prevent its further running out. It was also due to this fact, that we had several electrometer tubes made of still smaller bore, and found one finally, that was most convenient to use.

Now, there being mercury in both the "U" tube and electrometer tube, the pressure apparatus was attached, and the open bulb (C) was raised until the mercury reached the end of the capillary, care being taken, not to apply ~~too~~ great a pressure, so as to cause the mercury to run out.

It remained, but, to drop acid enough

and you will be able to identify a lot more of the species
you find. I think it depends a lot on how well you
know the area and the soil and weather
and different situations you come across.

There's a number of other water requirements, just
like there are with other aquatic plants, but the
main thing is probably that it isn't really under too much
strain.

Watering frequency will vary a lot
as you have different kinds of plants growing, but
basically you're going to plant the seeds and then
keep them moist so when they germinate, especially the
seed germination, it's going to take about a week or
so to germinate and then the plant will start to
grow at that point.

So if you're growing your plants from
seed you're going to have to keep them moist for about a week
until they germinate and then you can just leave them
in the same spot until they grow big enough to
be transplanted into the pond.

The best way to grow your plants
is to start with seed and then after about a

in the stopper, to fill it, and to raise the "U" tube and stopper until the end of the capillary was immersed in the acid.

Finally, it was necessary to observe whether the acid rose in the capillary so as to reach the mercury in it. If the air in the end of the capillary prevents the rise of the acid, the left hand bulb (B) should be given a slight squeeze, just enough to force one or two drops of mercury out of the capillary. Then upon removal of fingers from the bulb, the acid will rise in the capillary and make contact with the mercury.

It is essential that there be no air bubbles in the capillary, as they will break the circuit and prevent the satisfactory operation of the instrument. If any air should lodge there, it can be dislocated and removed by the above described method.

The short circuiting key was then closed and the electrometer was ready for use. The first photograph is a very good one of the instrument, showing all its parts plainly.

The first experiment performed, was, of course, the application of a small potential, to see if

and 1970 and 1971 at the 100 KHz or 2000 Hz with the following results in the case when the signal is

1000 Hz or 10000 Hz

selected as quality of 10000 Hz

shows a very significant effect on the quality of the signal. In the case of 1000 Hz and 10000 Hz the quality of the signal can be seen and compared by looking

at the following figure. In figure 10 it is shown that the quality of the signal is not much different for the two frequencies. The quality of the signal is good enough for the purpose of the experiment. The quality of the signal is good enough for the purpose of the experiment.

The quality of the signal is good enough for the purpose of the experiment. The quality of the signal is good enough for the purpose of the experiment.

The quality of the signal is good enough for the purpose of the experiment. The quality of the signal is good enough for the purpose of the experiment. The quality of the signal is good enough for the purpose of the experiment. The quality of the signal is good enough for the purpose of the experiment.

The quality of the signal is good enough for the purpose of the experiment. The quality of the signal is good enough for the purpose of the experiment. The quality of the signal is good enough for the purpose of the experiment.

the instrument would operate as we expected it to. We had never seen an instrument of its kind in operation, so that we were curious to ascertain whether it would do so, or not.

The short-circuiting key was opened and a potential of about .3 volts, obtained from a derived circuit was applied. A movement of the meniscus, easily discernible with the naked eye, occurred. The short-circuiting key was next closed and the meniscus moved in a direction opposite to that it had previously moved in; that is, towards its first position. Whether or not it returned exactly to its starting point, was yet to be determined.

Knowing that the instrument would operate, the experimental work was at once begun.

DETERMINATION OF POLARITY.

From the literature on the Capillary Electrometer, it seemed, that for a given direction of E. M. F. applied to the electrometer, the direction of the movement of the meniscus was definite.

The first experiment consisted of an attempt to verify this phenomenon. A potential whose polarity was known, was applied to the terminals of

the following section we will discuss the main features of the model.

the instrument, and the direction of deflection was noted. The polarity of the same P. D. was then reversed by a reversal of leads, and it was found that the movement was in the opposite direction.

Further, it was found, that the meniscus of the mercury moved in the direction in which the P. D. was applied. That is, if the E. M. F. was so applied, that its direction was from the electrometer tube to the "U" tube, then the meniscus would move in the same direction as this P.D. was applied. Short-circuiting, of course, caused motion in the direction opposite to that caused by an application of an E.M.F.

In the work following, the P.D. was always applied so that the meniscus would move up in the capillary, that is, the positive side of the P.D. was applied to the "U" tube binding-post. It was marked thus. This procedure was followed, not only because it was the most logical, but because of the fact that if the reverse direction were used, the application of the P.D., when the meniscus was near the end of the capillary tube, would start the mercury flowing out of it, and thus cause great inconvenience.

PRECAUTIONS IN USING THE CAPILLARY ELECTROMETER.

Before proceeding to the calibration and

non-informative or informative) and a communication and control model with a central role for the information flow between both health and non-health care providers. This model will determine the effectiveness of the intervention and its acceptability by the target patient population.

The second aim is to develop a model for the implementation of the intervention in clinical practice and to evaluate the acceptability and feasibility of the intervention among patients with chronic diseases. The third aim is to evaluate the effectiveness of the intervention in reducing the number of hospital admissions and emergency room visits among patients with chronic diseases. The fourth aim is to evaluate the cost-effectiveness of the intervention.

As an outcome measure we will use self-rated health status, quality of life, and physical and psychological well-being. We will also measure the number of hospital admissions and emergency room visits among patients with chronic diseases. The intervention will be evaluated in two consecutive phases. In the first phase, the intervention will be developed and refined. In the second phase, the intervention will be evaluated in a pilot study. The pilot study will be conducted in a single hospital setting. The pilot study will be followed by a larger-scale trial. The larger-scale trial will be conducted in multiple hospitals. The results of the larger-scale trial will be used to refine the intervention and to evaluate its effectiveness and cost-effectiveness. The results of the larger-scale trial will be used to refine the intervention and to evaluate its effectiveness and cost-effectiveness.

other experiments conducted with the instrument, it was experimented with, to learn its peculiarities of action and manipulation, so as to be entirely familiar with the apparatus before undertaking the rest of the experimental work.

A Cathetometer was used to watch the meniscus. This is an instrument used for measuring small vertical distances very accurately. Readings to .0001 cm., can be made with this instrument. A telescope is attached, by means of which the meniscus was viewed.

The following points were noted, and are put down in the order of their importance.

First, if the instrument is in good working condition, that is, when it is clean and the mercury and sulphuric acid are clean, upon applying the P.D., the meniscus will instantaneously respond, and move to its final position instantaneously, giving a deflection corresponding to that P. D.

For the same P.D., the meniscus will move to the same height in the capillary every time, if, of course, the meniscus starts at exactly the same point each time.

If after the application of the P.D.,

— 1 —

and the first time I have been asked to do so. I am very
pleased to receive your wonderful welcome.

5.191

and some guidance will help you to understand what
you are doing by simply reading with pleasure to get
the most out of your reading.

and accompanying movement of the meniscus, the P.D., be applied again, the meniscus will not be affected.

After every application of a potential the instrument must be short-circuited before applying another. Upon short-circuiting, if there be no leaks in the pressure apparatus, and if the instrument is clean, the meniscus was returned to exactly the same position.

The above characteristics of the instrument are very important, and it is only by virtue of them, that the instrument can be of any practical value whatsoever. When not in use, it must invariably be short-circuited or electrolytic action will take place and it will be found that upon then closing the short-circuiting key, a movement of the meniscus will take place, as though a potential had been applied. The meniscus will return to that position in which it was located before leaving the instrument.

The maximum E.M.F., which should be impressed upon the electrometer is about .8 volts.

It was found that on applying an E.M.F., larger than the above value, electric dissociation took place and hydrogen gas was given off. This gas collects at the surface of contact between the acid

John B. Lewis and John W. Dwyer, *Industrial Relations*, Vol. 1, No. 1, Spring 1963.

and the other two were at the same time
and the other two were at the same time

and the mercury, and the amount of gas will increase with the number of applications of this large electro-motive force, until the circuit in the electrometer is broken, and the instrument will no longer respond to potentials.

Whenever the pressure in the electrometer tube is changed by means of the pressure apparatus, the short-circuiting key must be closed. Otherwise the electrometer will accumulate a charge which will expend itself by a movement of the meniscus when the key is closed after changing the pressure.

It was also observed, that when the instrument was on open circuit, the pressure required to move the meniscus by means of the pressure apparatus was greater than that required when the electrometer was short-circuited.

This seemed to show an apparent resistance, as though a charge resisted the movement of the meniscus.

When the instrument is not in use or rather when it is left from one time to another, the pressure should be released. The weight of the mercury column in the electrometer tube is ordinarily, suffic-

and others, although the literature on the subject is not
extensive enough to allow us to draw firm conclusions. The
available evidence seems to point to the following:
- In general, there is a strong positive correlation between
the number of hours spent in television viewing and the
number of hours spent in reading. This relationship is
not necessarily causal, however, as it is likely that both
reading and television viewing are influenced by other
factors such as age, sex, education level, and family size.
- There is a significant negative correlation between the number of hours spent in television viewing and the number of hours spent in reading. This
relationship is not necessarily causal, as it is likely that both
reading and television viewing are influenced by other
factors such as age, sex, education level, and family size.
- There is a significant positive correlation between the number of hours spent in television viewing and the number of hours spent in reading. This
relationship is not necessarily causal, as it is likely that both
reading and television viewing are influenced by other
factors such as age, sex, education level, and family size.

ient in itself, to prevent the creeping of acid up above the mercury column without the added pressure. Again, if the meniscus be allowed to stand continually in the small part of the capillary bore, the mercury will be liable to stick whenever passing that part of the tube.

If the meniscus moves while the instrument is on short circuit, it is either a sign of leakage in the pressure apparatus, or an indication of a potential, due either to a dirty contact or to the acid in the electrometer creeping up above the mercury column to the platinum leading-in wire. If the latter occurs, the mercury must be emptied from the electrometer tube, washed, cleaned, and dried, before it can be used again.

The Capillary Electrometer is unaffected by magnets or stray magnetic fields due to heavy currents passing through wires near it. It is unaffected by slight mechanical jars, but is affected, if the electrometer tube itself, is tapped severely with a pencil or other such implement. Under such circumstances, it may even start the mercury flowing out of the capillary.

the 14-year-old girl had been found dead at her home in the early hours of Saturday morning. The girl's mother, who was also found dead, had been found lying face down on the floor of their bedroom. The girl's father, who was also found dead, had been found lying face down on the floor of their bedroom. The girl's mother, who was also found dead, had been found lying face down on the floor of their bedroom. The girl's father, who was also found dead, had been found lying face down on the floor of their bedroom.

When this occurs the acid in the stopper is displaced, and overflows, running over the stand and brass clamps corroding them, and causing great inconvenience.

All in all, the capillary electrometer must be handled with great care, and all of the above precautions must be regarded, if satisfactory operation be desired.

With the above characteristics noted, the instrument can then be intelligently used.

CALIBRATING THE ELECTROMETER.

The scheme for calibrating the electrometer is indicated in Fig. 9.

Two resistance boxes were connected in series with a storage cell and about 110000 ohms was introduced in the circuit. Then, by means of two traveling terminals, as indicated in the figure, any part of the total P.D., across the 110000 ohms could be used to impress upon the Capillary Electrometer. By means of a double-pole double-throw switch (O), this potential could be applied to the potentiometer for measurement.

A Leeds and Northrup Potentiometer was used with a standard Cadmium Cell. By means of a

and more or less like it.
 We will consider the problem of what
 action you can take to help the firms
 implement such changes
 without giving up your job.
 Now let's say the firm does not allow us
 to make such changes by themselves but
 instead requires that we do it
 through a committee of workers and
 management. In this case we will
 need to find a way to
 work with management and still have
 our workers make the changes we want.
 This is a difficult task because
 management often has different
 goals than workers. For example
 management may want to
 increase profits while workers
 may want to increase their
 wages or benefits. In addition
 management may want to
 keep workers from changing
 the way they work while workers
 may want to change the way they work.
 To solve this problem we can do
 several things:
 1) We can try to negotiate a deal
 between management and workers
 where management agrees to
 make some changes while workers
 agree to give up some of their
 demands. For example, management
 might agree to give workers
 a raise if workers agree to
 work longer hours. Or workers
 might agree to give up some
 of their benefits if management
 agrees to give them a raise.
 2) We can try to change
 the way management
 works so that they are
 more open to change.
 3) We can try to change
 the way workers work so
 that they are more
 open to change.
 4) We can try to change
 the way management
 interacts with workers so
 that they are more
 open to change.
 5) We can try to change
 the way workers interact
 with management so
 that they are more
 open to change.

storage cell and rheostat, the potentiometer was standardized against the standard cell so that the potentiometer would read exactly as indicated by the indications on it. Care must be taken in standardizing, to have the polarity of the standard cell opposed to that of the storage cell. A Leeds and Northrup Galvanometer, used with a reading lens, was used to obtain the balance points.

Now, with the potentiometer standardized, by means of the double-pole double-throw switch, the E.M.F., to be impressed on to the electrometer was thrown on the potentiometer for measurement. The resistances of the potentiometer were then adjusted until a balance was indicated by the galvanometer. This indicates that the P.D., to be measured was equal to the P.D., indicated by the potentiometer. The value of this E.M.F., could then be read off directly.

Next, the short-circuiting switch of the electrometer was opened, and the double-pole double-throw switch was thrown over in the opposite direction. This impressed the above measured E.M.F., on the electrometer causing a deflection of the

and intercalations will probably have been removed by heat or fire. Various old village buildings and other structures are covered over with many large irregular stones and mortar and brick earth. All of these materials will be continuing to deteriorate and crumble. The ground is also heavily covered with small stones at some areas, particularly along the stream bed. Building materials including timber and plaster are also heavily contaminated with sulphur.

Various mineralization occurrences will be evident in sand and gravel areas and can be described as follows: (1) Sulfide mineralization and associated with iron pyrite and chalcopyrite, with sulfide staining of the sand and gravel. (2) Sulfide mineralization with pyrrhotite and magnetite associated with iron pyrite.

10. Number of inhabitants per house

Approximately 600 persons were interviewed with reference to the number of people per house. Many houses contained from 1 to 10 persons while 100 households contained 1000 adults. This indicates the population is somewhat well distributed with regard to size of family.

meniscus.

The readings of the deflections corresponding to the various potentials were made with the Cathetometer at first. The arrangement of Cathetometer and electrometer is shown clearly by the second photograph. However, it was found impracticable to obtain consistent results with the use of the Cathetometer since it was not located on a solid foundation, and any slight jar or movement would throw it out of adjustment, causing errors in the readings.

For this reason a better and more convenient method was devised. A steel scale graduated to $1 \frac{1}{100}$ " was placed behind the capillary tube and the meniscus was observed by means of a high power telescope. Under these conditions no tedious adjustments were necessary, since the deflections could be easily read off directly from the scale to $1 \frac{1}{1000}$ " by estimating between the divisions.

The meniscus was set at a certain point of the capillary by means of the pressure apparatus, and the reading on the scale indicated the exact position from which the meniscus would start each time

и відповідь зроблено засудженому. Але він не зміг відповісти на питання про те, чи він був учасником злочину, який вчинився в селі Красногорівка. Тоді суддя відмінив попереднє засудження та відправив його до СІЗО.

After a long stay in the U.S., he returned to his family in Germany, where he was welcomed by his wife and two sons.

upon applying the potential after short-circuiting. The data of calibration was then obtained, readings being taken of corresponding E.M.F.s and deflections of the meniscus.

From the data obtained the calibration curve was plotted between potentials and deflections. The data obtained is given below:-

P.D.	Deflections.
VOLTS	INCHES.
.0051	.03
.00985	.042
.01975	.053
.03312	.065
.05161	.08
.06711	.088
.07296	.1
.09427	.112
.11710	.125
.15217	.150
.16180	.159
.2	.17
.24142	.176
.31561	.185
.35012	.189
.37510	.191
.4201	.196
.47005	.20
.50942	.205
.60100	.210
.75021	.22

From an inspection of the calibration curve it is at once evident, that where the capillary is of uniform bore, the deflection is exactly pro-

卷之六

and it is by this method, while continuing with the first, that you
will have your first good uniformity of size and
weight. When you have obtained a good uniform
size, you will then proceed to make up
the remaining part of the
uniform size, and you will
thus have a uniform
size throughout.

• Conclusion

3

— 10 —

portional to the potential applied. Where the tube begins to widen, a corresponding increase of P.D., does not produceas great an increment of deflection and the curve then begins to bend. Also, where there is an irregularity in the tube the curve deviates from a straight line. This is clearly shown by the curve.

This curve is only of any value as a means of measuring E.M.F. 's when the meniscus is located at the same point as where the calibration was taken, and when the head of mercury in the electrometer tube is the same, as that used in the calibration. The former can be adjusted by the pressure apparatus, but it is evident that the latter depends upon, whether no change of mercury, etc., has been made or not. Later on in this thesis, several improvements will be suggested whereby the latter condition can also be made constant. However, with the aforementioned details constant, the instrument could be used for measuring very small potentials.

USE AS A ZERO INSTRUMENT OR GALVANOMETER.

This is the field in which the Capillary Electrometer has the greatest application, that of use

1

the old man, who had been a carpenter and had learned
the trade by himself, was now a master at his work and
had made a fortune, so that he could afford to buy
what he wanted. But he had no wife or children, and
therefore he had no one to whom he could give his
money, and he was very lonely.

5

и симметрической структурой. Важно отметить, что введение в макромолекулу азота в виде аминогруппы не только не нарушает структуру полимера, но и способствует ее упрочнению. Аминогруппы способны к образованию водородных связей с карбонильными группами, что приводит к упрочнению полимера.

Revised by the Board of Directors

and the following day he was sent to the hospital in New York City.

as a galvanometer to indicate the absence of a P.D.

It is, of course, evident that the height of mercury column and the position of the meniscus has no bearing on the use of the instrument in this field, as the only necessary action, is the indication of the presence of an E. M. F., no matter how small.

To test its adaptability in this field, the electrometer was connected in parallel, through a switch, with the Leeds and Northrup Galvanometer. Then with the standard cell and battery, the potentiometer was standardized, both the electrometer and galvanometer being used as the zero instruments.

By means of the switch, a balance was first obtained with the Leeds and Northrup Galvanometer. Then the switch was thrown over and the electrometer became the zero instrument.

Although an exact balance was indicated by the galvanometer, read with a lens, a deflection could still be noted of the meniscus of the electrometer, through the telescope. This was repeated several times in order to verify the results.

This is conclusive proof that the Capillary Electrometer, is more sensitive than the Leeds and Northrup Galvanometer, and is, therefore, as far as

sensibility is concerned, adapted to use as a galvanometer.

It should be stated, that the Leeds and Northrup Galvanometer is the most sensitive portable galvanometer in the Laboratories of Armour Institute of Technology.

SENSITIVENESS OF THE ELECTROMETER.

The next experiment conducted, was the determination of the minimum potential to which the meniscus would respond.

If the fingers were placed across the terminals of the short-circuiting key, when the key was open, and if they were rubbed on the terminals, the meniscus would respond. This would at once indicate great sensitiveness.

Again, the terminals of an ordinary magnet-type of a telephone receiver were placed across the terminals of the electrometer. Then loud words were spoken into the receiver. The meniscus moved up and down considerably, showing that it was affected by the potentials which were induced in the receiver by talking into it. This was a very interesting proof of its great sensitiveness, since the E. M. F.'s induced in the receiver are very small.

the first time in our history, the number of children born per woman has fallen below the replacement level, which is about two children per woman.

According to the UN, there is now a worldwide population decline in 100 countries around the globe, and in 1990, 100 million babies were born in the world.

The number of people in the world is still growing, but at a much slower rate than in previous decades, and

the world's population growth rate has been falling steadily since 1950, and

now stands at just over one percent, and is expected to continue to decline until the middle of the next century, according to the UN.

Population growth rates remain highest in Africa, where women have nearly six children each, while women in Europe have only 1.4 children each.

There are significant regional differences in birth rates, with the highest rates found in sub-Saharan Africa, and the lowest in East Asia and the Pacific.

While the world's population is growing, it is also becoming older, with the median age of the world's population rising from 24 in 1950 to 30 in 2000, and

the median age of the world's population is projected to rise to 37 by 2050.

In order to obtain some definite knowledge of the magnitude of the smallest potentials that the electrometer would respond to, a potential of about .2 volts was started with. Then it was gradually decreased, noting each time any deflection of the meniscus.

With the smallest potential that could be obtained with the resistance boxes, previously mentioned, a value of .000111 volts gave quite a noticeable deflection. This indicates that the electrometer will easily respond to E.M.F.'s smaller than $1/10000$ th's of a volt.

If the instrument has dirt in it, and is not in good working order, the small potentials will not be noticeable on the instrument.

RESISTANCE OF THE INSTRUMENT.

The resistance of the Electrometer was measured with a Wheatstone Bridge. Since the resistance is not constant, varying as it does with the position of the meniscus in the capillary, several values were obtained at different parts of the capillary.

The values of the resistance obtained varied from 29700 ohms to 88000 ohms.

It was found, that if a balance was obtained with the Bridge and then the leads to the Electrometer

1997-1998 school year would be used to

select students following the procedures set by the Board of Education. An independent organization would be responsible for the placement of students with learning disabilities and would be responsible for the identification of students with learning disabilities. The placement of students with learning disabilities would be determined by the Board of Education.

Students with learning disabilities will have available to them other educational services within their schools. The Board of Education shall communicate with their parents and

parents of all other students who have been identified as having learning disabilities, and shall provide for the identification of such students.

It is the policy of the Board of Education to provide for the identification of students with learning disabilities and to provide for the identification of students with learning disabilities.

Students with learning disabilities will receive services from the Board of Education in accordance with the provisions of the Board of Education's policies and procedures. Students with learning disabilities will receive services from the Board of Education in accordance with the provisions of the Board of Education's policies and procedures.

Students with learning disabilities will receive services from the Board of Education in accordance with the provisions of the Board of Education's policies and procedures.

Students with learning disabilities will receive services from the Board of Education in accordance with the provisions of the Board of Education's policies and procedures.

were reversed, a balance would no longer exist, and upon rebalancing, a very high resistance would be measured; as high as 155000 ohms, in one case.

This seems to show, that there is an E.M.F. of its own generated in the electrometer, which in one case, in the measurement of resistance, was opposed to, and in the other case, aided the E.M.F. of the cell with which the resistance was measured.

ELECTROSTATIC CAPACITY OF THE ELECTROMETER.

The capillary electrometer, by its action, would tend to show that it has electrostatic capacity. When the P.D. is applied, the meniscus moves to a different point of the capillary and stops. The application of the same potential again, without previously short-circuiting, has no effect on the meniscus. Short-circuiting, brings the meniscus back to its original position.

This action is exactly like that of a condenser, only in this case, we have an attendant movement of the mercury column.

If the instrument has electrostatic capacity, the question might arise as to where the dielectric is located. In all probability the dielectric of this

the world's largest oil shale reserves in the United States. The
oil shale reserves are located in Colorado, Wyoming, and
Utah. The oil shale reserves are estimated to contain over
100 billion barrels of oil.

Oil shale is a sedimentary rock containing kerogen, which is
a solid hydrocarbon. When heated, kerogen can be converted
into oil. Oil shale is also known as "green gold" because it
contains a large amount of oil. Oil shale is used to produce
petroleum and natural gas.

Oil shale is a sedimentary rock that contains kerogen. Kerogen
is a solid hydrocarbon that can be converted into oil or
natural gas. Oil shale is found in several countries, including the
United States, Canada, Australia, and Venezuela. Oil shale is
used to produce petroleum and natural gas. Oil shale is
also used to produce oil and natural gas.

Oil shale is a sedimentary rock that contains kerogen. Kerogen
is a solid hydrocarbon that can be converted into oil or
natural gas. Oil shale is found in several countries, including the
United States, Canada, Australia, and Venezuela. Oil shale is
used to produce petroleum and natural gas.

condenser is a film at the surface of contact between the mercury and sulphuric acid.

The electrostatic capacity of the electrometer was then measured by the following method.

A standard condenser of one-half micro-farad capacity was charged to a given potential. It was then discharged, by means of a charge and discharge key, through a sensitive Ballistic Galvanometer, whose deflection was read with a telescope and scale. The deflection was noted. Let us call this deflection D1 and the capacity of this condenser C1.

Then the electrometer was charged to the same potential, and by means of the same key, discharged through the Ballistic Galvanometer and the deflection was noted. Let us call this deflection D2 and the unknown capacity of the electrometer X.

Now, the deflections of a Ballistic Galvanometer vary with the quantity of electricity discharged through it.

Therefore, in the first place, the quantity $Q_1 = EC_1$ and gives a deflection D1.

For the second case, the quantity is $Q_2 = EX$ and gives a deflection D2.

E being the same in both cases, we have that,

and the other in making him the first to get his audience
and his message to a positive and productive place.

After a short while of discussion you can either
choose to go with the maximum benefit or
the minimum benefit. As an example you would
not want to have your audience leave feeling like
they have been sold something they did not need
and will never use again. You want to leave a meeting
with your audience feeling like they just learned
something new and exciting that will help them in their
everyday life. This is what I mean when I say it
is important to have a clear goal.

With your goals set the next step is to determine how
you will have your audience understand your message. You
will need to determine if your audience is more visual
or auditory. You will also need to determine if your audience
is more comfortable with reading or listening to a speaker and
what is best for them.

With this information you can now start to plan your
meeting. You will need to determine what type of

venue you will need to make sure you can
get the most out of your audience. You will also
need to determine what type of presentation

$$\frac{Q_1}{Q_2} = \frac{D_1}{D_2} = \frac{C_1}{X}$$

therefore $X = C_1 \cdot \frac{D_2}{D_1}$.

The capacity was measured with three different potentials applied to the condensers.

Since, upon applying these E.M.F.'s to the electrometer, a movement of the meniscus occurs, the capacity measured, is that of the point to which the meniscus moves after the application of the E.M.F.

Therefore, for the smaller potentials, the capacity obtained will be that of the lower or fine bore part of the capillary, while for the larger E.M.F.'s the capacity obtained, will be that of the larger or upper part of the capillary tubes. The averages of several deflections were taken as the correct values.

The following data was obtained.

Capacity of standard condenser $C_1 = 1/2$ micro-farad.

P.D. Equivalent to.	Deflection for Standard Condenser.	Deflection for Electrometer.
10000 ohms	D1 39 mm.	D2 219 mm.
7000 ohms.	27.3 mm.	192 mm.
300 ohms.	1.5 mm.	14.8 mm.

This gives by the above formula, capacities of 2.81 m.f., 3.5 M.f., and 4.94 m.f., respectively. The

the first time in history that the world has been able to witness such a remarkable and rapid development in the field of science and technology. This is due to the fact that the world has become a global village where information and knowledge are easily accessible and can be shared by everyone. This has led to the development of various industries and businesses that have contributed significantly to the economic growth of the country. The government has also played a key role in promoting research and development in various fields, which has helped to create a conducive environment for innovation and entrepreneurship. The result is that India is now considered as one of the most dynamic and rapidly growing economies in the world.

Category	Value (in ₹)	Percentage Change (%)
GDP	25,00,000	+8.5
Industrial Production	12,00,000	+7.2
Agriculture Output	8,00,000	+6.8
Services Sector	7,00,000	+9.1

India's progress is also reflected in its growing economy, which has shown significant growth over the past few years. The GDP has increased from approximately 25,00,000 in 2010 to 35,00,000 in 2020, indicating a steady growth rate of about 7% per annum. This growth has been driven by various factors, including the development of infrastructure, the growth of the services sector, and the increasing demand for Indian products both at home and abroad.

capacity is larger for the small or lower part of the capillary and smaller for the larger or higher part of the capillary, or in other words, the capacity varies inversely as the diameter of bore for any given electrometer tube.

USE WITH ALTERNATING CURRENTS.

The next experiment was the determination of the action of the electrometer under alternating currents.

The A.C. power was taken from an alternator, which was run at a speed and field current low enough to give about 20 volts terminal E.M.F. By means of two potential transformers of 10 to 1 ratio, this E.M.F. was stepped down 100 to 1 to about .2 volts. This E.M.F., was then applied to the electrometer.

Although the frequency of the current was very small, all that could be seen was a slight chattering of the meniscus up or down, so slight in fact, that it could not at all be measured with the telescope and scale. Although the potential was .2 volts effective value and the maximum would be .283 volts, the deflection as far as could be seen, with the apparatus on hand, was no where near as large as that given by .2

and the young should be shown how well behaved it is to respond
to the teacher if he or she asks them to do something new quickly.
With a little practice and a few more repetitions we can get the child
so much used to the new task that he or she will begin to do it without
any prompting.

• [View all the news stories on this page](#)

volts direct current. The calibration curve shows a deflection of .181" for .28 volts.

It seems that the inertia of the mercury column is great enough to damp out the oscillations of the P.D., even at low frequencies. At high frequencies, this damping would be greatly magnified.

However, since an oscillograph is seldom used to obtain the actual magnitude of an E.M.F., or current, the fact that the meniscus does not make full deflection is not vital. The important consideration, is the production of an exact reproduction of the wave-shape, irregularities, etc.

Whether or not a wave-shape could be obtained, can only be proved after an oscillograph arrangement would be made. From appearances, at least, under the telescope, it would seem, that wave-shapes could not be obtained, and if they could be obtained, the magnification required, would be so great that the instrument could not be made portable.

From the action of the instrument as we saw it, we believe, that, should an arrangement be constructed whereby the oscillations could be seen, the inertia of a mercury column at high frequencies would damp and smother out any irregularity that may be present

As well as the possibilities of a single species being
adapted to all three, it is also true that
Cathartes will be able to live in the same area as
the Andean Condor and have opportunities for interbreeding and crossing.
The Andean Condor has the same diet and is more gregarious,
and therefore requires no other protection than
protection of its habitat and its food-supply.

in the wave. This would necessarily make it of no practical value, since, as previously stated, it is desired that an oscillograph should show all the irregularities in the wave-shape, its object being wholly that.

However, should any work along this line be done later on, a few suggestions as to the probable method of arranging this oscillograph might be of value.

A narrow slit could be arranged in front of the capillary tube, just wide enough to permit a beam of light from an electric arc to pass through it without diffraction. Now, the light would be cut off by the mercury in the capillary, but could pass through the sulphuric acid. Then, as the meniscus moved up or down under an alternating current E.M.F., more or less light would be cut off by the meniscus according as it moved up or down. Now, by an arrangement of lenses, the image of the top of the meniscus can be enlarged. All that remains then, is to provide a motion at right angles to that in the capillary tube, which should be in synchronism with the alternating current potential. The combination of these two motions at right angles, will give a wave shape, if thrown on a screen or sensitized plate. One part on one side of the wave shape would, of course, be

the 1990s, when the Chinese government began to open up its economy to the world. This period also saw the rise of a new generation of Chinese entrepreneurs who had made their fortune through the import and export trade, and who were able to invest in the Chinese market.

Today, China's economy is one of the largest in the world, and it continues to grow rapidly. The Chinese government has implemented various policies to encourage foreign investment and technology transfer, and has invested heavily in infrastructure development, such as roads, railways, and ports. This has created a favorable environment for foreign companies to do business in China. In addition, the Chinese government has been working to improve its intellectual property laws and regulations, which has helped to protect the rights of foreign investors. Overall, China's economic growth has been driven by a combination of factors, including its large population, its low labor costs, its proximity to major markets, and its government's support for economic development. As a result, China has become a major player in the global economy, and its influence is likely to continue to grow in the future.

light, while that on the other side would be in total darkness.

It seems that many of the ideas and schemes embodied in the General Electric Company Oscillograph could be used in constructing an oscillographic arrangement with the capillary electrometer.

If such an oscillograph could be constructed, and if it would faithfully reproduce pulsating E.M.F.'s, it would be applicable to the study of E.M.F.'s which cannot be studied by the present form of oscillograph.

A very good example of the field in which the capillary electrometer, as an oscillograph, would be applicable, is that of the study of telephone currents. And experiment has been spoken of previously which shows how readily the capillary electrometer will respond to such currents. There is no doubt, that if the capillary electrometer could be made into an oscillograph practically, it would photograph such waves as the present oscillograph would be uninfluenced by.

THE EFFECT OF CONCENTRATION OF ACID.

In order to determine the effect of varying the concentration of acid in the electrometer, various concentrations of same were used. Note was taken of the

cause it will become easier to tell who has been holding it for

so long.

Finally, you could do a more specific test:

Take your subject's name, and make sure that all the letters in his/her name are different from the other names in the group. If you can't find a name like this, then you could just add a few extra letters to the beginning or end of the name.

After you have found a name like this, then you can start to look for other names that are similar to it. You can do this by looking at the first letter of each name in the group, and then looking at the second letter, and so on until you find a name that is similar to the one you chose.

Once you have found a name like this, then you can start to look for other names that are similar to it. You can do this by looking at the first letter of each name in the group, and then looking at the second letter, and so on until you find a name that is similar to the one you chose.

After you have found a name like this, then you can start to look for other names that are similar to it. You can do this by looking at the first letter of each name in the group, and then looking at the second letter, and so on until you find a name that is similar to the one you chose.

Finally, you can start to look for other names that are similar to it.

Finally, you can start to look for other names that are similar to it.

Finally, you can start to look for other names that are similar to it.

deflection of the meniscus with the same potential for different acid strengths. It was found that the strength of acid had no noticeable effect on the magnitude of deflection.

SUGGESTED IMPROVEMENTS.

The experimental work having been completed, improvements for the apparatus, suggested by our work with it will be put forth. In the first place, a finer adjustment of the pressure apparatus should be made, so that the pressure can be adjusted to a nicety, and thus control the meniscus similarly. This can be arranged by means of a fine screw adjustment together with a rougher adjustment such as was used in the instrument in this thesis.

In the calibration of this instrument, the fact was spoken of regarding the changing of the head of mercury in the electrometer tube. If a small tube were connected in to the electrometer tube at a point just above the bend in the tube, it could serve as an overflow tube and thus the head of mercury could always be made constant, no matter how many times the mercury be changed. A pinch-cock would of course, be needed at the end of the overflow tube, so as to allow the pressure apparatus to do its work.

For oscillographic work it would be well to weld this overflow tube in as low as possible, thus de-

which will affect the new and future conditions will be well worth the trouble and effort now to make certain that these will be effective without undue influence on law and regulation.

RECOMMENDED COURSE

1. The Congress should support the bill introduced by Senator George W. Norris of Nebraska, which provides for the establishment of a national bank which would be controlled by the people and which would have no power to issue or hold any other than small amounts of money and to have such currency with the amount of its issuance not to exceed 10% of the value of its assets with due care and caution, so that the currency would be convertible into gold and could be exchanged with the national bank for gold.

2. The Senate and the House should support the bill introduced by Senator George W. Norris of Nebraska, which provides for the establishment of a national bank which would be controlled by the people and which would have no power to issue or hold any other than small amounts of money and to have such currency with the amount of its issuance not to exceed 10% of the value of its assets with due care and caution, so that the currency would be convertible into gold and could be exchanged with the national bank for gold and which would be used only for the payment of debts and taxes.

creasing the head of mercury and thereby decreasing the inertia. However, there is a limit to this, as a very small head of mercury would allow the acid to creep up above the mercury.

Another important improvement suggested is that, instead of using long expensive platinum wires, attached to binding posts, which must be cemented on to the glass, short platinum wires should be welded through the glass, at points just above the surface of the mercury. These would then serve as leading in wires and would obviate the necessity of binding posts.

Instead of using a scale or Cathetometer to measure deflections in use as a potential measuring instrument, the capillary tube itself, could be graduated into divisions. Under such circumstances, together with improvements suggested above, there is great possibility for this instrument in the measuring field.

In use as a galvanometer, arrangements should be made whereby the telescope is permanently attached to the electrometer.

Instead of locating the short-circuiting switch on the instrument stand, it would be advisable to locate it off the stand, to prevent jarring the electrometer

and in addition, the company will be able to
claim that it has a flat land in the same area.

* 70 30

Journal of Clinical Endocrinology and Metabolism, Vol. 130, No. 10, October 1995, pp. 3033–3039.

the child's reading difficulties point back to inherent language problems or to reading problems of the child's parents. Children with reading difficulties may also have language problems.

—Wichtige Anmerkungen 1. Die Begriffe „sozialer Wohnungsbau“ und „sozialer Wohnungsbau mit Betriebsteil“ sind hier nicht als Begriffe der Rechtssprache zu verstehen, sondern als Begriffe der sozialen Politik. Sie kennzeichnen die Art und Weise, wie ein sozialer Wohnungsbau finanziert wird. Ein sozialer Wohnungsbau ist eine Form des sozialen Wohnungsbaus, bei dem die Kosten für den Bau und die Unterhaltung überwiegend aus sozialen Quellen finanziert werden. Ein sozialer Wohnungsbau mit Betriebsteil ist eine Form des sozialen Wohnungsbaus, bei der die Kosten für den Bau und die Unterhaltung überwiegend aus sozialen Quellen finanziert werden, während die Betriebsaufgaben durch einen Betrieb wahrgenommen werden.

Such a situation would be a waste of resources and could potentially compromise the safety and health of patients.

when opening or closing the switch.

DISCUSSION AND CONCLUSIONS.

In the first place, the Capillary Electrometer, can be recommended as a galvanometer or zero instrument. It is very sensitive, responding even to the rubbing of fingers across its terminals.

In tests such as those of determining capacities and inductances where galvanometers are required, it is a troublesome matter to obtain balances with an ordinary magnet-type instrument. In such cases the Capillary Electrometer should be invaluable. It is not affected by stray fields nor ordinary mechanical jars, all of which greatly affect the ordinary sensitive galvanometer.

It is a quick-acting instrument, responding instantaneously to potentials.

It is a cheap instrument to construct. From the specifications and drawings herein enclosed, a Capillary Electrometer could easily be constructed for about Seven Dollars. This could materially, be further reduced by introducing short platinum terminals as suggested previously. This would decrease the cost to about Five Dollars. Compare this with the cost of a Leeds and Northrup Galvanometer with which the Electrometer was compared for sensitiveness,

number of households number both

in 1970 and 1980.

— houses planned were mostly new ad-

ditional units, or additions, to the household, and not new construc-

tion of separate buildings. In 1970 there were 4,377 addi-

tions to existing dwellings, while in 1980, according to

the census, there were 10,000 such additions.

With 100 dwellings one household will accommodate 5.6 persons in 1980, down from 5.1 million households

responsible for more than 30 million people. This is a significant drop in the rate of growth in household size over the last 10 years. According to the latest figures, the average household size in 1980 was 5.6, while in 1970 it was 6.0. Thus, the rate of growth in household size has been reduced by 25 percent, and the rate of growth in population by 20 percent.

Population in 1980 reached

100 million, and continued growth is still at

100 million, and continues to increase, despite the slowdown in the

rate of growth. The population of urban areas, which accounted for 71.1 percent of the total in 1970, increased to 75.6 percent in 1980. The rural population, which had been declining, decreased to 24.4 percent in 1980. The rate of growth in the rural population was 1.2 percent in 1970, compared with 0.8 percent in 1980. The rate of growth in the urban population was 1.4 percent in 1970, compared with 1.2 percent in 1980.

which is sold commercially for about Twenty five dollars.

However, the Capillary Electrometer could hardly ever be made as portable as the above Galvanometer; for instance. The Galvanometer is fool-proof and will stand more or less hard usage. The Electrometer, however, must be operated in a certain way if results are to be obtained, and cannot undergo too rough usage.

The Galvanometer is very much more compact, and is easier to handle. It would be very difficult in commercial practice to have the users of a Capillary Electrometer to observe all the precautions herein noted, all of which, are necessary. It is its great difficulty in handling, that, to a large extent, offsets its possibilities. Any instrument in which acid, which is free to fall about, is a part, is a difficult matter to operate commercially.

Nevertheless, in a Laboratory or a testing-room, where the instrument could be permanently fixed, the Electrometer could be made a desirable instrument.

The same difficulties met with in use as a zero instrument, together with some others mentioned, handicap the use of an electrometer, as a potential measuring instrument. However, with the improvements suggested, practicability is approached.

and encouraged people will be added over as more information becomes available. Likewise, the *Journal of Neuroscience* will communicate with the scientific community to make available any new findings.

Wanted: Major and minor film stars
for weekly Hitler Show from 11-15 September 1937

the 1990s, when oil prices fell to \$10/bbl. This led to a decline in the
number of oil wells drilled at relatively shallow depths, although
drilling activity increased significantly as oil prices rose to over \$30/bbl.
However, there will be 12 new massive oil fields in the
world by 2010 and whether drilling activity will continue to rise
depends on whether oil prices remain high enough to stimulate
new investment in exploration and development. The
international advantage of countries producing oil at lower oil
prices will be maintained as long as oil prices remain low.

and a small number of other species will prove most abundant, probably in place of those mentioned above, which have probably been off.

After I have all the info sorted out, the "ghost" of someone will often return to your consciousness in the form of a shadow. This shadow can be a person you know well or someone you have never met before.

Finally, as to its adaptability for the indicating instrument of an Oscillograph, which was that part of the thesis where great possibilities were expected, this can be said. It is hardly thought that it can be realized. The movement of the meniscus under an alternating current of low frequency was not discernible with the telescope. It would seem, therefore, that the friction in the tube, together with the inertia in the mercury column, would damp out all irregularities of an electrical alternating or pulsating wave, especially of high frequency. However, there is a possibility if arrangements can be made whereby only one cycle of a wave be impressed on the electrometer. If this first cycle could be photographed, perhaps it would show the correct form of wave.

Yet it is impossible to determine what further work and time might develop in the field of the Capillary Electrometer.

Respectfully submitted,

Harry Ostergren
Lambs Kalu.

May 17, 1909.

ЧЕРВОНОГРАДСЬКИЙ РАЙОН

Червоноградський район є земельно-лісовим та промисловим районом. Він має значущу роль у виробництві підприємств харчової промисловості та деревообробки. Але він має і недоліки. Найголовнішим з них є те, що він має недостатнє транспортне сполучення з іншими районами та містами. Це обумовлено тим, що він розташовано в глибокій долині річки Сіверський Донець, яка обмежує його з півночі та південного заходу. Тому він має дуже складні транспортні умови. Але він має величезну промисловість, яка виробляє різноманітні товари для всіх сільськогосподарських підприємств та населення. Це дозволяє йому мати добру економіку та високий рівень життя.

Червоноградський район є земельно-лісовим та промисловим районом. Він має значущу роль у виробництві підприємств харчової промисловості та деревообробки. Але він має недоліки. Найголовнішим з них є те, що він має недостатнє транспортне сполучення з іншими районами та містами. Це обумовлено тим, що він розташовано в глибокій долині річки Сіверський Донець, яка обмежує його з півночі та південного заходу. Тому він має дуже складні транспортні умови. Але він має величезну промисловість, яка виробляє різноманітні товари для всіх сільськогосподарських підприємств та населення. Це дозволяє йому мати добру економіку та високий рівень життя.

H.O.
L.N.

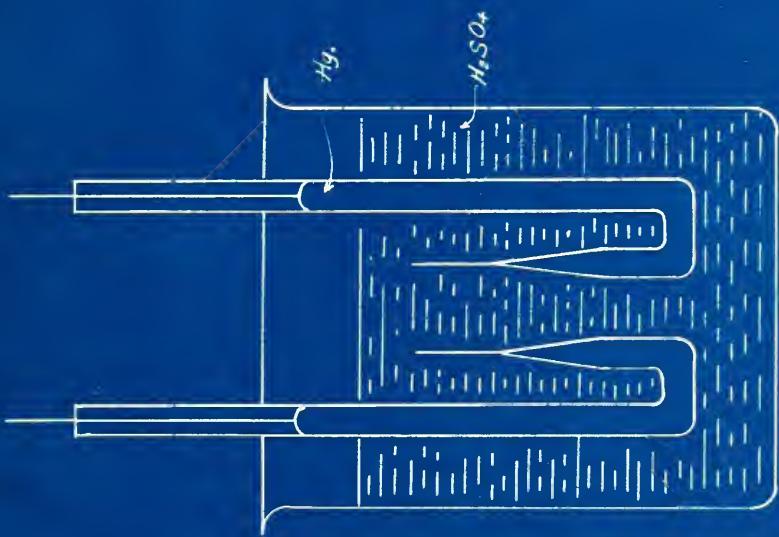
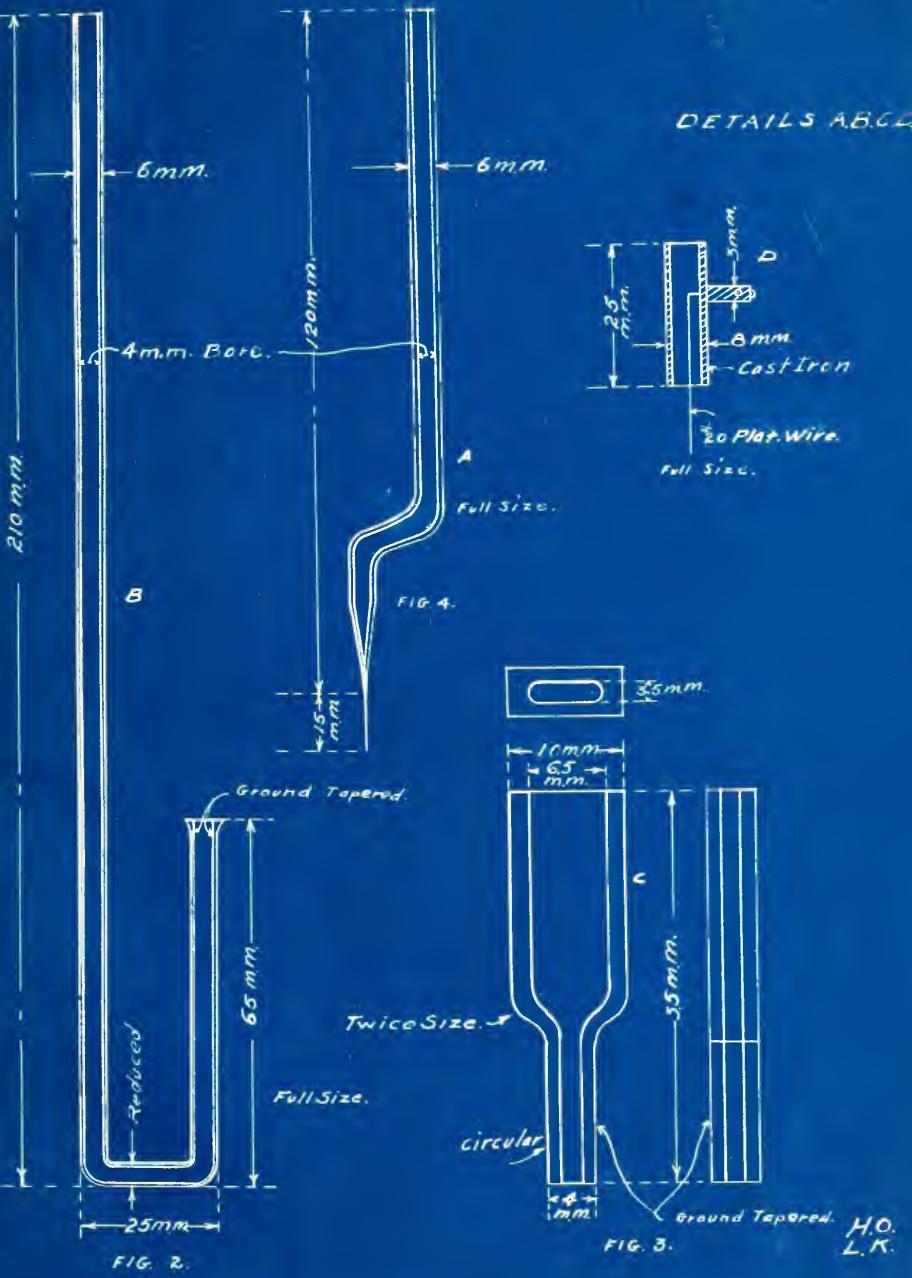


FIG. 1.

ARMOUR
INSTITUTE OF TECHNOLOGY
Engineering



ARKON
EXCELSIOR OF THEATRE

© 1997 Arkon

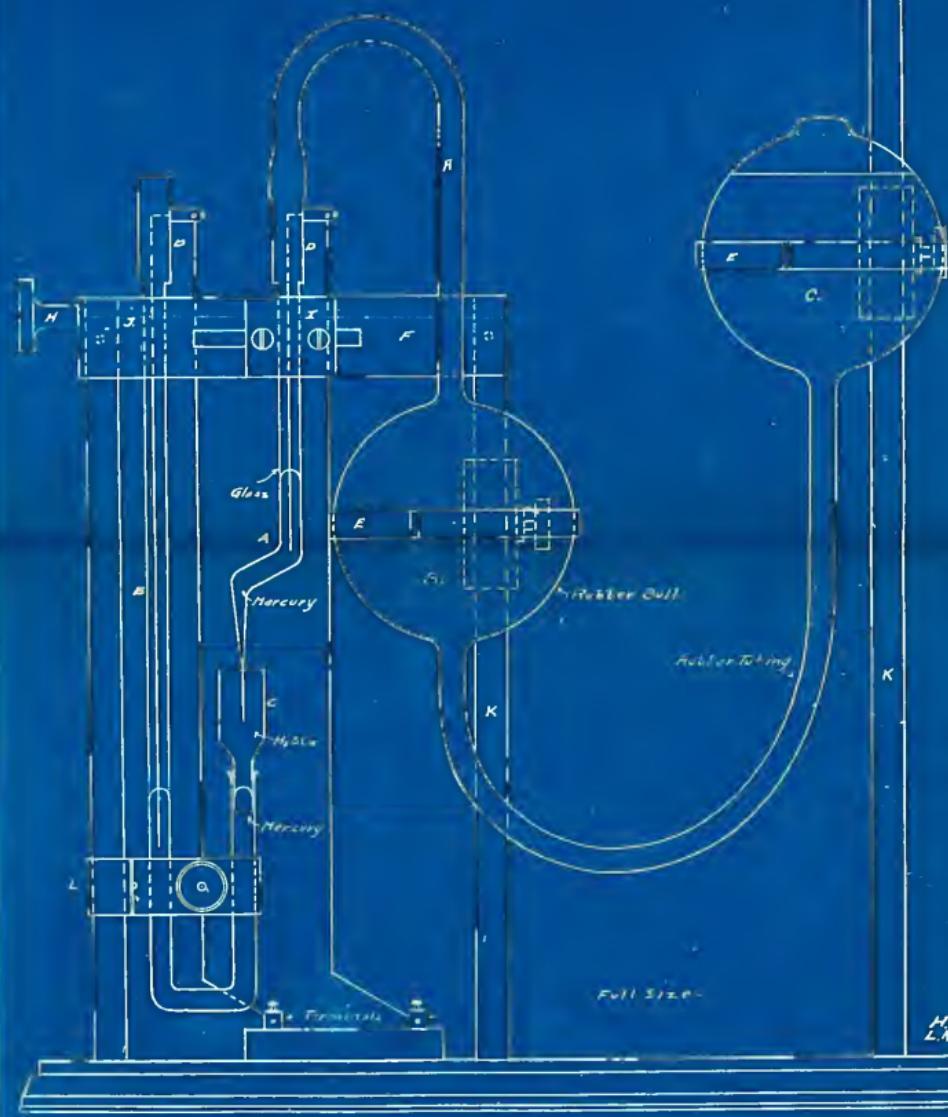
FIG. 5.
ASSEMBLY-FRONTVIEW.

AIRPORT
INSTITUTE OF TECHNOLOGY
JAN 1962

ARMOUR
INSTITUTE OF TECHNOLOGY


FIG. A.

ASSEMBLY-FRONT VIEW.



ARMED
FORCES OF THE UNITED STATES
ARMED FORCES

FIG. 6.

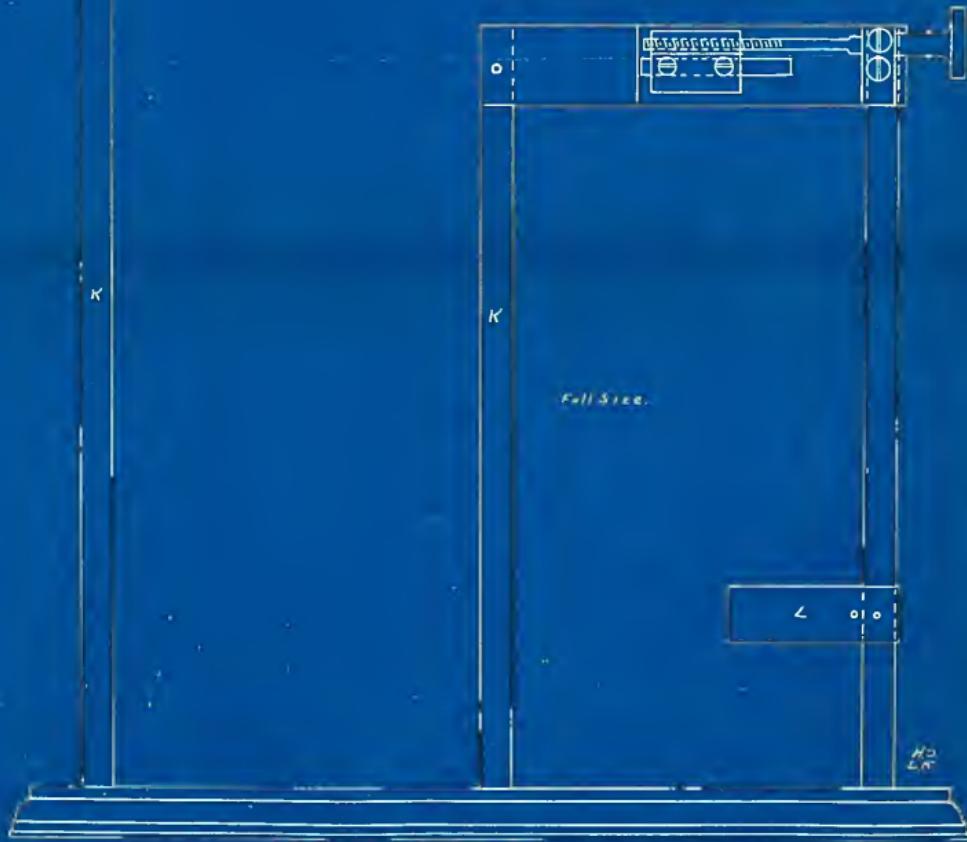
FRAME BACK VIEW

ARMOUR
INSTITUTE OF TECHNOLOGY
P.O. BOX 3547

ARMOUR
INSTRUCTIONS ON TRUNKING
100 ft. - 100 ft.

FIG. 6.

FRAME BACK VIEW

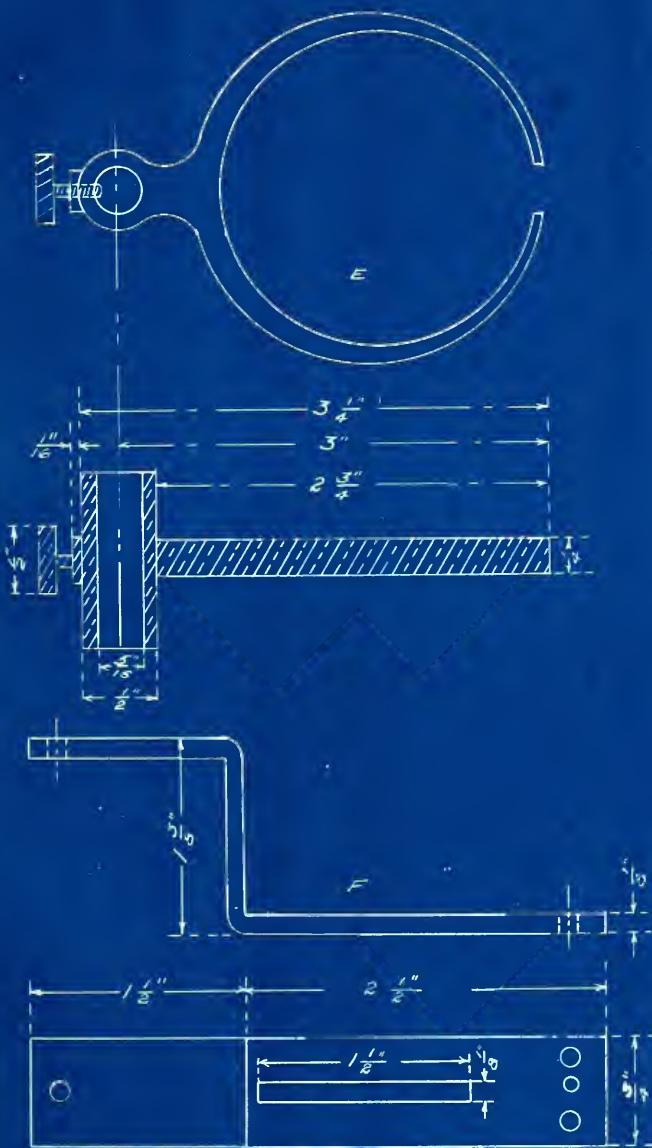


8

THE
LITERATURE OF THE
AMERICAN
CIVIL WAR

FIG. 7.

DETAILS E, F



ARMED
DEPARTMENT OF REUNION AND
PROGRESS

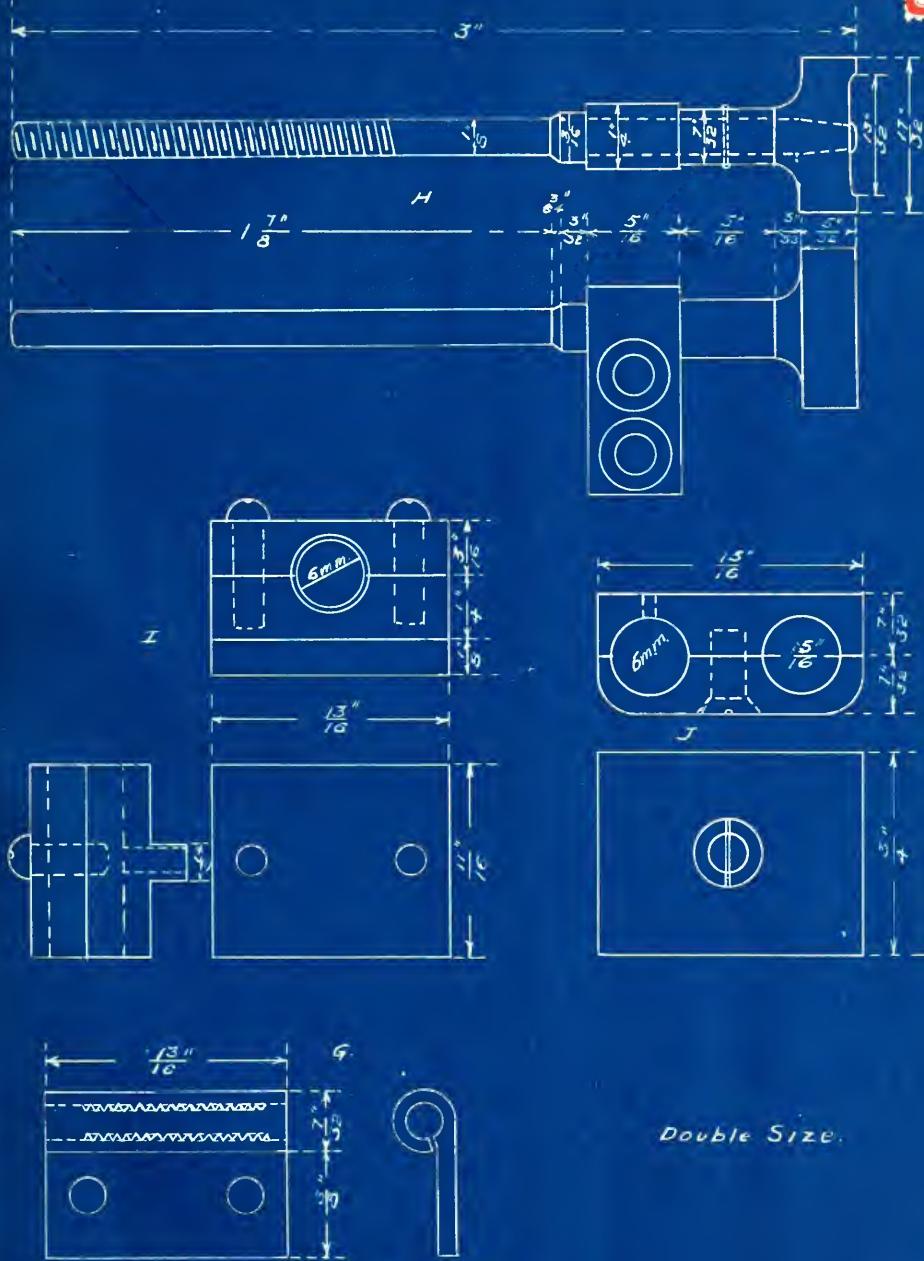


Fig. 8.

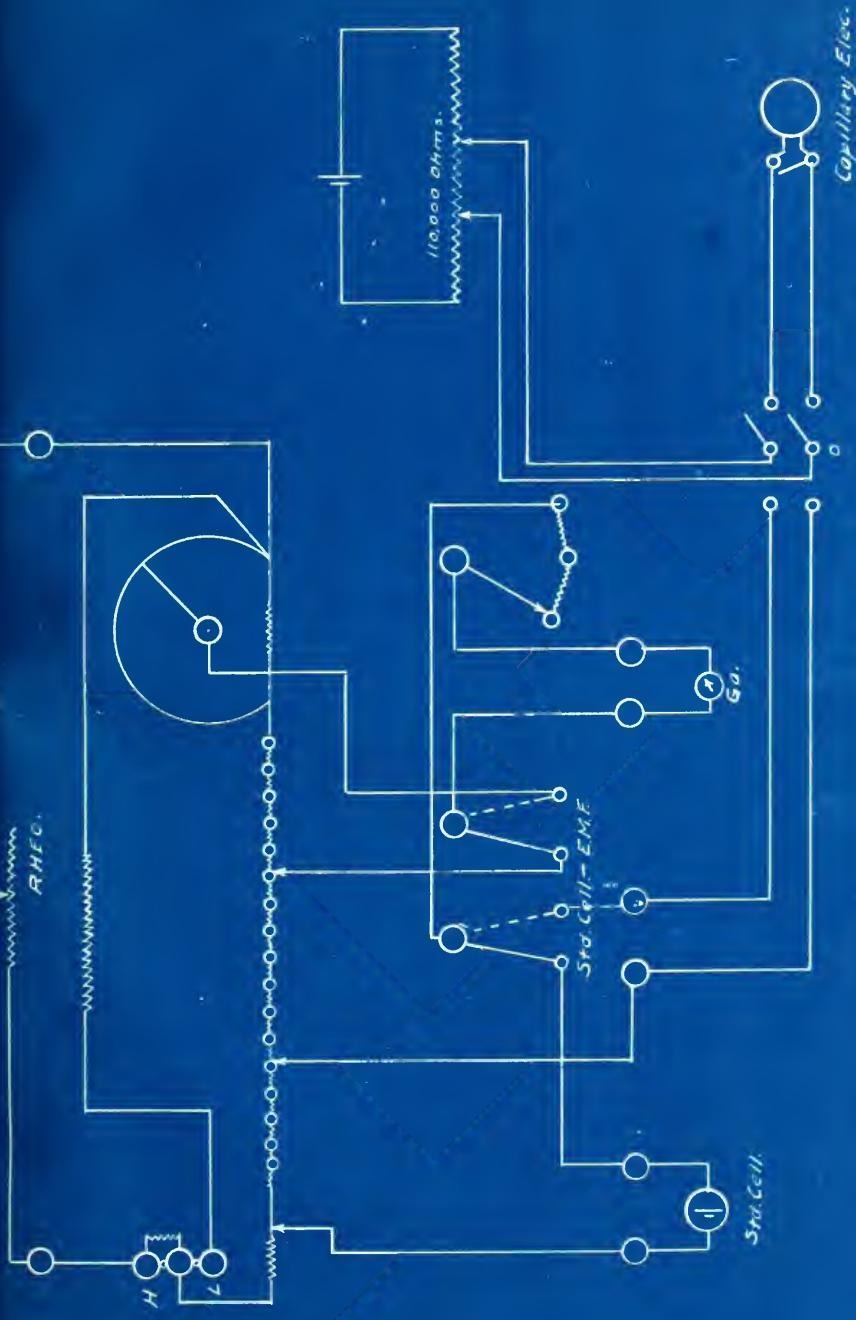
Double Size.

H.Q.
L.K.

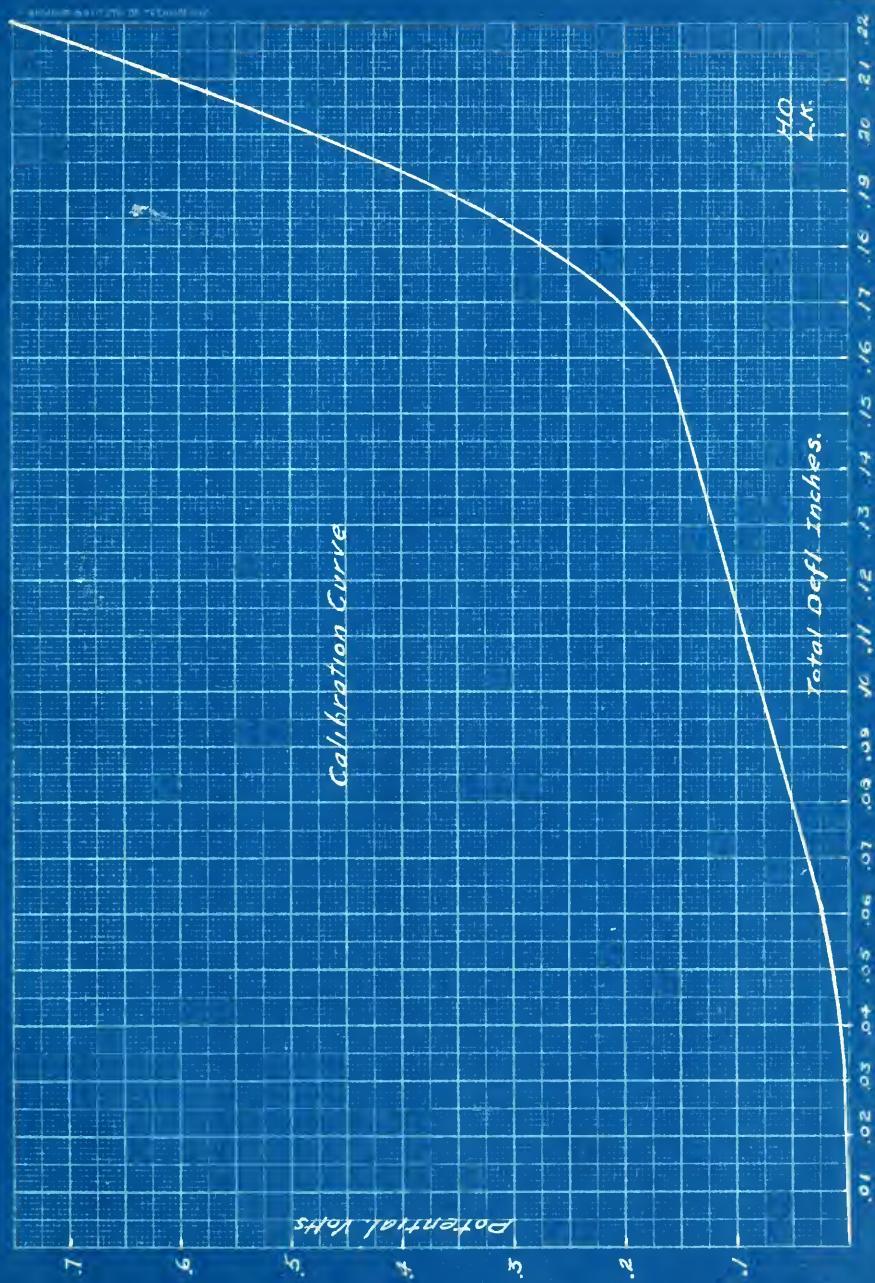
ARMOUR
INSTITUTE OF TECHNOLOGY
DETROIT

SCHEME FOR CALIBRATION USING
LEEDS + NORTHUP POTENTIOMETER

Fig. 9



ADMIRAL
ADMIRALTY CHARTS AND PUBLICATIONS
1970



ANISIUS
EXCERPTS ON DOCUMENTS
1970



ABOUT
DEPARTMENT OF TECHNOLOGY
Faculty



ARMOUR
REVIEW OF TECHNOLOGY
Editorial Staff



*ADVANCED
EDUCATION IN TECHNOLOGY
PROGRAM*





